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(54) THE MANUFACTURING MATHOD ELECTRODE OF THE LI-ION SECONDARY BATTERY.

Abstract

Background Information

1 **Purpose:** by using the water which is harmless in especially, the human body as a solvent, an electrode is manufactured with the thing about the manufacturing mathod electrode of the Li-ion secondary battery. A performance and capacity fade of the battery followed the moisture residual are prevented, the purpose sets. **Configuration:** for this, in the present invention, in manufacturing the active material of an electrode, the soft carbon in which the water content ratio is small is used as the active material. Here the SBR system binder, and the water and thickening agent are mixed and it agitates. After the active material which in this way, is manufactured is coated on a material, it hots air-dry at the mood of 100~130°C. It is dry to the degree of vacuum less than same *** 10^{-5} torr subsequently. And after roll-pressing this, the anode of a battery is manufactured with the process of cutting in the predetermined size. **Effect:** since instead of using the water with organic solvent, is harmful to the human body the environmental contamination can be prevented. And the realization of the battery which takes advantage of the water since it is nearly perfect through the drying process of spanning the second, removing the moisture is possible. Also, a performance and capacity of a battery can be improved.

Description

Details of the Invention

• Purpose of the Invention

The Technical Field to which the Invention Belongs and the Prior Art in that Field

2 The present invention relates to the manufacturing mathod electrode of the Li-ion secondary battery, particularly, to the anode manufacturing method of the Li-ion secondary battery suitable to use the water as a solvent in the styrene-butadiene rubber (SBR) system binder.

3 The lithium ion battery uses the liquid electrolyte which melts the lithium salt in the organic solvent more than a canine as long as it includes the oxygen radical the carbon or the carbon composite is used as the negative active material the lithium - transition metal oxide is used as the positive active material, nitrogen radical, and the sulfate residue etc. By generating the electromotive force when the lithium ion is moved between a cathode and anode charge and discharge are comprised.

4 Here, according to the kind of the electrode silver cell like an anode, it has the some extent difference. However, after the active material, consisting of the carbon and the binder consisting of the PVDF (polyvinylidene fluoride) and the organic solvent consisting of the NMP (N-methyl-2-pyrrolidone) are mixed and the slurry is manufactured, this is coated on the material consisting of the copper (Cu) foil. After again roll-pressing with a drying, it manufactures with the process of cutting in the predetermined size.

5 And disclosed is the mixing binder including the polyamic acid in US US5,380,606 A as the binder used in the Holotrichia of an electrode, and one or more polymer selected from the group consisting of the polyamide resin, and the polyvinylpyrrolidone and hydroxyalkylcellulose.

6 But the so far known binder has the problem that the organic solvent consisting of NMP which is the material which is harmful to the human body is used. Therefore the manufacturing process is complicated due to that and the use of the different equipment is required. And the environmental contamination is raised in use and discard.

7 With considering this problem the water was conventionally to a solvent. The method for manufacturing the active material of an electrode by using the soluble SBR system binder in the drag net was proposed.

8 But in case of using the water as a solvent the bad effect that is fatal due to the moisture remaining after the Holotrichia of an electrode in the inside in the performance of a battery is reached. Therefore, in the above, and the put to practical use of that will not be achieved.

Technical challenges of the Invention

9 The problem of the above-described prior art is canceled. Therefore, the present invention tries to solve the harmfulness and environment contamination problem by using the water as the solvent of a binder. And the moisture which additionally remains inside an electrode is removed and the manufacturing method electrode of the Li-ion secondary battery possible the put to practical use of a battery be possible is provided, the purpose sets.

10 For this, as to the present invention, in manufacturing the active material of an electrode, it uses the soft carbon in which the water content ratio is small as the active material. Here it mixes and agitates the SBR system binder, and the water and thickening agent. After it coats the active material which in this way, is manufactured on a material, it hots air-dry at the mood of 100~130°C. It is dry to the degree of vacuum less than same *** 10^{-5} torr subsequently. And after roll-pressing, it manufactures the plate with the process of cutting in the predetermined size.

11 As described above, as to the present invention, since instead of using the water with organic solvent, is harmful to the human body it can prevent the environmental contamination. And the realization of the battery which takes advantage of the water since nearly completely removing the moisture through the drying process of spanning the second is possible. Also, it can prevent a performance and capacity fade of a battery.

Structure & Operation of the Invention

12 The desirable embodiment for realizing below, and the present invention decides to be illustrated.

13 In the present invention, it illustrates for the electrode used for the Li-ion secondary battery.

14 The li-ion secondary battery uses the lithium - transition metal oxide as the positive active material. And it uses the carbon, and the carbon composite as the negative active material. It mixes this with a binder, and the water and

thickening agent and it manufactures the slurry. Particularly, because the active material of a cathode does not have the conductivity, it adds the carbon to the conductive agent and it uses.

- 15 Here, as to an electrode, especially, an anode, in manufacturing the active material, it uses the water instead of the organic solvent consisting of NMP which is harmful to the human body. It uses the soluble SBR system binder in the drag net.
- 16 The soluble SBR system *** Mw / Mn=2~2.3 is in the water.
- 17 And as to the present invention, according to use the water as a solvent, it considers after the Holotrichia of an electrode that the moisture remains. In order to the residual amount to a minimum, it uses the soft carbon in which the water content ratio is small. The cokes or the soft carbon can be used as the soft carbon.
- 18 Accordingly, the present invention the soft carbon to the active material in manufacturing the active material of an anode. It together mixes the SBR system binder, and the water and thickening agent (CMC) and it agitates and here manufactures the slurry.
- 19 In this way, the manufactured negative active material slurry is coated on the surface of the materials. And the removal of the water at this time, used as the solvent of the present invention is effectually, effectively comprised. For this, in the present invention, it is dry in the mood of 100~130°C for 5~10 hours. And at this time, 70~80% of the moisture disappears. And it moisture is evaporated to the same temperature subsequently for 6~10 hours with the vacuum dry less than *** 10^{-5} torr of the rest 10~15%.
- 20 Thereafter, as to the above-described plate, the electrode of the fixed level is manufactured with the electrode of the fixed level after the roll press and sawing process.

- 21 In this way, as to the manufactured anode of the present invention, by using a mandrel in the state interposing a separator and arranges a cathode to an inside, it is reeled. And it is accepted to the inside of a can. By after injecting an electrolyte, interposing a gasket in the opening of a can and sealing the cap assembly hermetically the secondary battery is manufactured with the secondary battery.

▶ Effects of the Invention

- 22 In the above, as shown in it can know through a configuration and the explained action, the manufacturing method electrode of the li-ion secondary battery materially cancels the problem of the prior art.
- 23 That is, as to the present invention, since using the water which is harmless in the active material in manufacture human body of an anode as a solvent, it can prevent the environmental contamination. Since the special facility is unnecessary, it can obtain the effect that the production process and cost are reduced.
- 24 And according to the present invention, the moisture is nearly completely removed through the thermo current drynes and the vacuum drying process of spanning the second. In that way the put to practical use of the battery taking advantage of the water is possible. A performance and capacity of a battery can be improved.

▣ Scope of Claims

Claim[1] :

- 25 The manufacturing method electrode of the Li-ion secondary battery, wherein it hots air-dry at the active material, consisting of the soft carbon in a container the binder of the styrene-butadiene rubber system, and the mood of the step, putting the water and thickening agent and mixing and agitated and the step, coating the active material which in this way, is manufactured on a material and 100~130°C; and after subsequently roll-pressing with the step that it is dried to the degree of vacuum less than same *** 10^{-5} torr subsequently, the plate is manufactured with the process of cutting in the predetermined size.

Claim[2] :

26 The manufacturing method electrode of the Li-ion secondary battery of claim 1, wherein it is the cokes or the soft carbon.

Claim[3] :

27 The manufacturing method electrode of the Li-ion secondary battery of claim 1 or 2, wherein it is the styrene-butadien *** Mw / Mn=2~2.3.

Claim[4] :

28 The manufacturing method electrode of the Li-ion secondary battery of claim 1 or 2, wherein the hot air dry down time does with 5~10 hour.

Claim[5] :

29 The manufacturing method electrode of the Li-ion secondary battery of claim 1 or 2, wherein the vacuum dry time does with 6~10 hour.